DAS Photonics

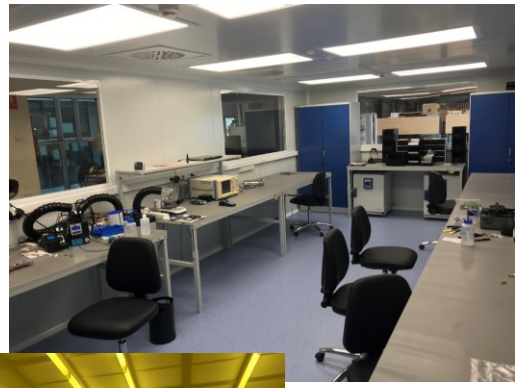
# Photonics for ISL and Quantum applications

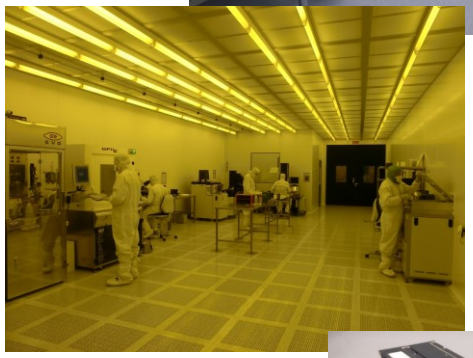
October 26th, 2020

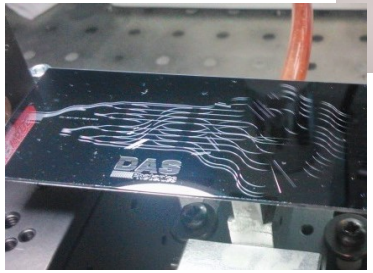
*EPIC Online Technology Meeting on Free Space Optical Communication and LiFi*

www.dasphotonics.com

# DAS Photonics: Company Overview







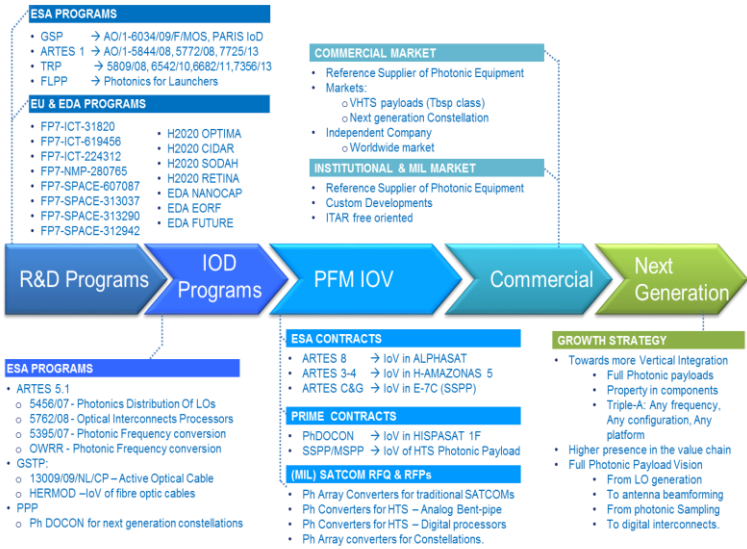
**Founded in 2005** as a technology start-up company with venture capital funds. Facility based in Valencia (Spain). World-class infrastructure.

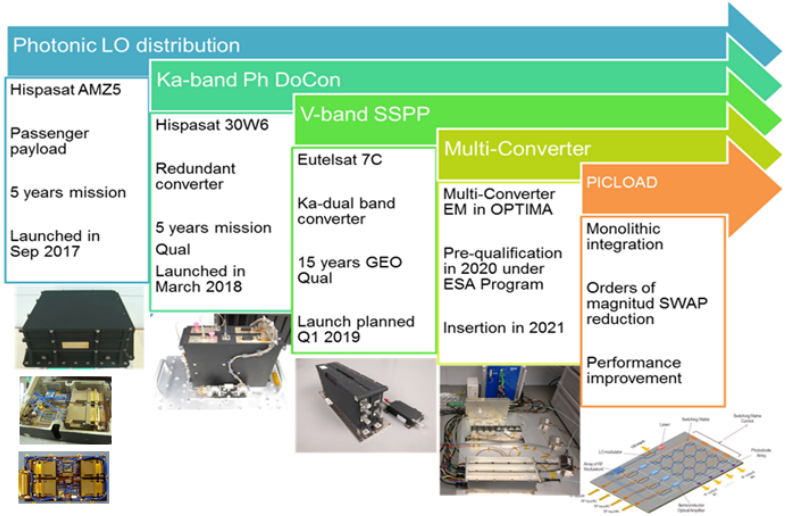
**DAS develops innovative products** based on its proprietary photonic technology for high performance sectors such as **D**efense, **A**vionics and **S**pace.

# DAS Photonics – Position & Heritage

## DAS Photonics: 15 years icebreaking in space with photonics

- Tens of programs executed in photonics
- Leader in First Active Optical Cables in space
- LO & Clock distribution In-Orbit demonstrations
- First Ka-band Photonic Converter in space
- First V/Q-band Photonic Converter in space
- SoA in Photonic Integrated Circuits for SATCOM
- 10Gbps-WDM **ISL Optical Front-End** on-going
- **Quantum Key Distribution** Space Payload development on-going




## Technologies & Capacities

- Analog and digital Tx/Rx (10Gbps/52GHz)
- WDM technologies
- Space-Qualified Optical Amplifiers
- Frequency Converter
- Up-Screening and qualification of photonics parts (*components portfolio*)
- Proven control electronics & specialization in photonic solutions

# Optical Inter-Satellite Links Front-End -- Communications

**Equipment under development**

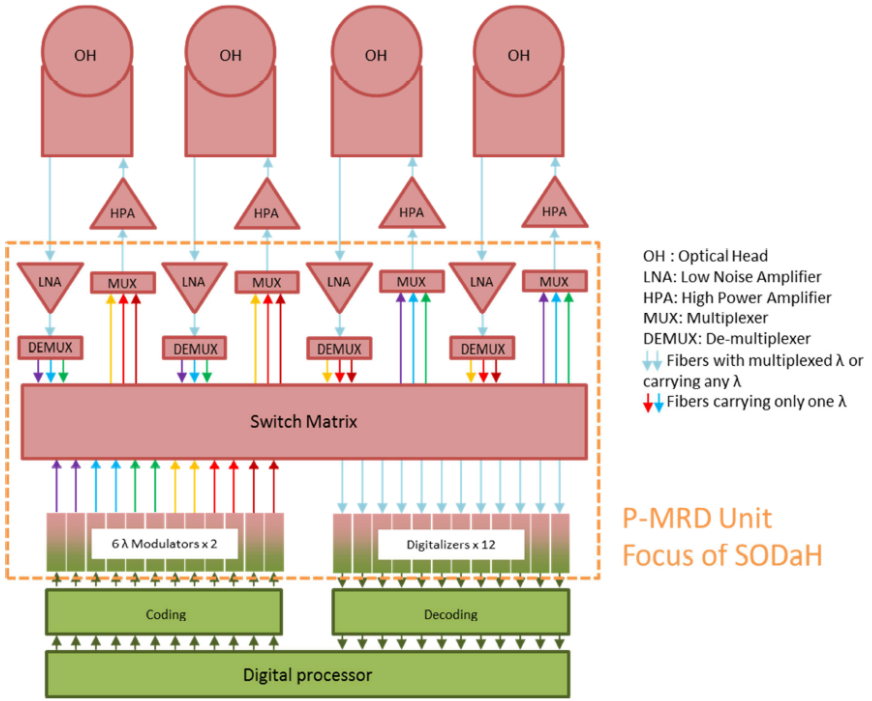
→ Optical front-end for flexible, scalable optical Inter-satellite links
→ Operating wavelength in 1550nm
→ Multiple aggregated optical carriers in each ISL
→ Flexibility at optical level with optical switching (internal routing, optical bypass…)

**DAS Photonic to develop and qualify :**

- Optical Low Noise Amplifiers
- Optical Transceivers at 10Gbps
- Optical multiplexer/demultiplexer in ITU-grid DWDM 1.6nm channel spacing

**Roadmap**

- Demonstration (TRL-5) → 2020
  Qualification & In-Orbit Demonstration → 2023



This project has received funding from the European Union's HORIZON 2020 Research and Innovation program under grant agreement No 821878

# SODAH

## P-MRD

### Photonic - Modulation, Routing and Digitalization Unit

Building on partner technology, the SODaH project aims for a TRL 5 demonstration of the P-MRD unit based on relevant tests at component and module level. The final concept will be modular and supports 3 wavelengths and 30Gbps per satellite.

### LNA - Low Noise Amplifier

The LNA pre-amplifies optical signals received by the Optical Heads.

**OBJECTIVES**

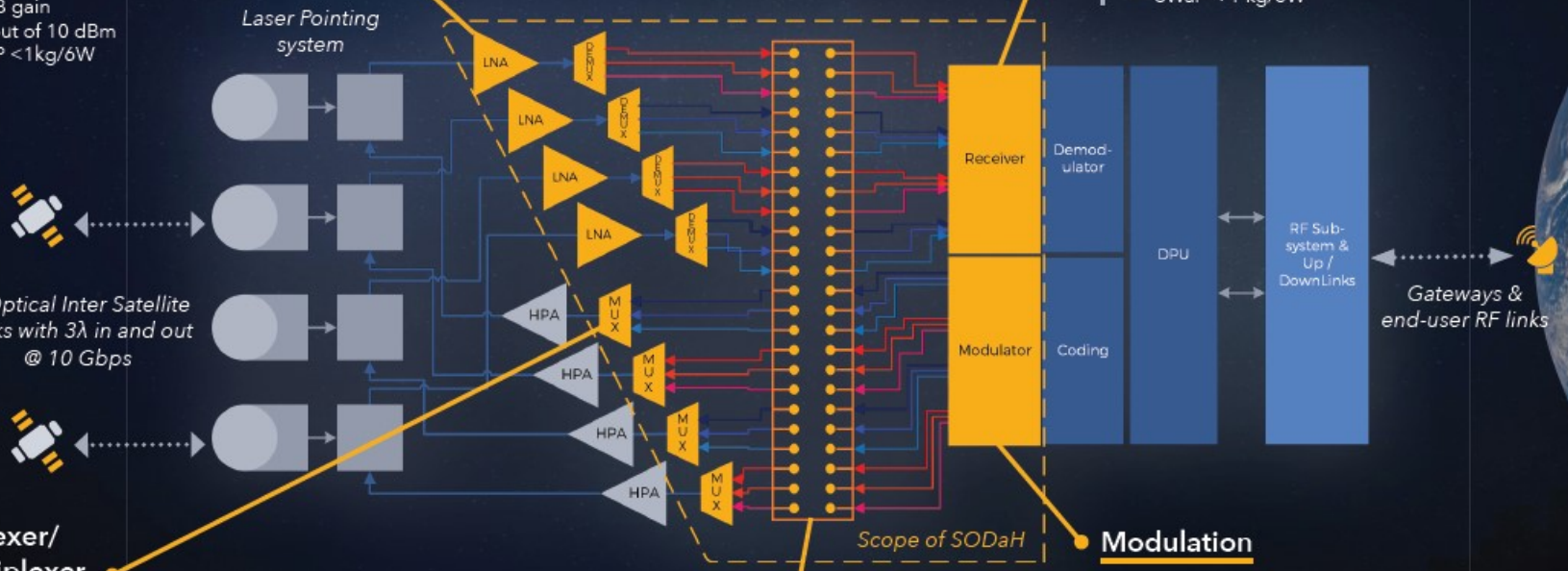
- 35 dB gain
- Output of 10 dBm
- SWaP <1kg/6W

### Receiver Units

The Receiver units digitize the photonic signals.

**OBJECTIVES**

- Input as low as -20 dBm @ 10 Gbps
- SWaP < 1 kg/6W




### Multiplexer/ Demultiplexer

The Multiplexer/Demultiplexer combines the various signals in the same laser link and enables DWDM around the 1550nm wavelength.

**OBJECTIVE**

SWaP <1.2 kg

### Photonic Switch Matrix

The Photonic Switch Matrix routes the photonic signals from 24 inputs to 24 outputs using DirectLight® terrestrial telecom technology.

**OBJECTIVES**

- Insertion loss below 2 dB
- SWaP <2kg/5W

### Modulation

The Modulators generate the photonic signals compatible with DWDM, either based on the use of external modulators, or on direct modulating lasers/transceivers.

**OBJECTIVES**

- Output of 5 dBm @ 10 Gbps
- SWaP <2 kg/41W

# Quantum Key Distribution Space Payload

**Equipment under development**

→ Quantum Key distribution payload for LEO
→ Space-grade Quantum Random Number Generator (QRNG)
→ Synchronization transceiver for the Quantum ISL Payload
→ Precursor of Single photon transmitter (*Faint Pulse Source (FPS)*)

**DAS Photonic to develop and qualify:**

- Evolution to space-grade a pre-existing proven QRNG solution
- FPS transmitter (BB84 DSP protocol)
- High Power Optical Transmitter for Synchronization
- Maximization of TRL in short term by
  - *use of qualified photonics parts with flight heritage*
  - *Partnership with expert in Quantum technology*
  - *"Spatialization" of proven ground solutions*

**Roadmap**

- Demonstration (TRL-5) → 2021
- Qualification & In-Orbit Demonstration → 2024